

REMARKS

Claims 1-6 and 8-16 are currently pending in this application. Reconsideration is respectfully requested in light of the following remarks.

The Examiner rejected claims 1-6 and 8-16 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent 5,740,811 to Hedberg et al. The Examiner also rejected claims 1-6 and 8-16 under 35 U.S.C. §102(e) as being anticipated by U.S. Patent 6,813,514 to Kroll et al. Applicants respectfully traverse these rejections.

The Examiner argues that claims 1, 15 and 16 do not recite using a single cardiac signal to derive information pertaining to atrial and ventricular events. The Examiner argues that although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. The Examiner also argues that the claims are open ended and therefore do not preclude the use of atrial and ventricular electrodes so that Hedberg and Kroll read on the claims. Applicants respectfully disagree.

Applicants' claimed invention as recited in claims 1, 15 and 16 is directed to a method and corresponding system for emulating a surface electrocardiogram (EKG) of a patient from a single sensed cardiac signal. For example independent claim 1 recites a method comprised in part by sensing a cardiac signal within the heart and adjusting relative amplitudes of portions of the sensed cardiac signal corresponding to atrial signals and portions of the sensed cardiac signal corresponding to ventricular signals so as to yield an emulated surface EKG. (Underlining added for emphasis only).

Thus, Applicants claimed invention recites sensing "a" cardiac signal. Patent claim parlance recognizes that the indefinite article "a" used to introduce the term "cardiac signal" in claims 1, 15 and 16 may carry a meaning of one or more. *Abtox, Inc. v. Exित्रon Corp.*, F.3d 1019, 43 U.S.P.Q. 2d 1545 (Fed. Cir. 1997). However, independent claims 1, 15 and 16 make clear through the structure of the elements recited therein that a single cardiac signal is being processed to yield the emulated surface EKG.

More specifically, claim 1 repeatedly refers to "the cardiac signal" as it describes portions of the cardiac signal that correspond to atrial signals and portions of the cardiac

signal that correspond to ventricular signals. The term itself, "the cardiac signal" reinforces the singular nature of the signal when referring back to the sensed signal and clarifies that only one cardiac signal is in question. In addition the recitation of adjusting amplitude of different portions of the cardiac signal carries no suggestion of multiple cardiac signals as argued by the Examiner.

Claims 15 and 16 have similar structure. For example, claim 15 recites a surface EKG emulation controller operative to distinguish portions of the cardiac signal corresponding to atrial signals from those corresponding to ventricular signals and to adjust relative amplitudes of the portions of the cardiac signal corresponding to atrial signals and the portions corresponding to ventricular signals so as to yield an emulated surface EKG.

Further, claim 16 is even more specific reciting means for distinguishing portions of the cardiac signal corresponding to near-field atrial signals from those corresponding to far-field ventricular signals. Claim 16 is therefore clearly reciting processing different portions of the same signal cardiac signal.

Applicants respectfully submit that Hedberg et al. do not disclose or suggest sensing a single cardiac signal that is used to generate a synthesized ECG. Rather, Hedberg et al. disclose a device and method for generating a synthesized ECG wherein measured signals from two or more intracardiac and/or extracardiac electrodes are combined and a synthesized surface ECG is obtained by subjecting the measured signals to signal processing. The term "synthesized ECG" as used by Hedberg et al. is explicitly defined to mean "a signal generated from at least two in vivo signals, such as at least two IEGMs, which provides the same information as a standard surface ECG." (Hedberg et al., col. 2, lines 57-64).

Thus, Hedberg et al. utilize a minimum of two IEGMs to generate a synthesized ECG. Hedberg et al. do not therefore adjust relative portions of a sensed cardiac signal that correspond to atrial signals and portions of that same signal that correspond to ventricular signals so as to yield an emulated surface EKG as recited in the present application. Accordingly, Applicants respectfully submit that claims 1, 15 and 16 are novel and non-obvious over Hedberg et al. and are therefore allowable. Applicants

further submit that claims 2-14 that depend from claim 1 are allowable as is claim 1 and for additional limitations recited therein.

Similarly, the system of Kroll et al. utilizes multiple internal cardiac signals to generate emulated surface EKGs. For example, Kroll et al. convert initial internal cardiac electrical signals into a time-varying vector $F(t)$ having individual elements corresponding to the various pairs of electrodes. The initial surface EKG signals are converted into a time-varying vector $E(t)$ having individual elements corresponding to the surface leads. A time-varying conversion matrix $M(t)$ of weighting factors is generated for converting internal cardiac signals into separate multiple-lead surface EKG signals, based on a comparison of the initial surface EKG signals and the initial internal cardiac signals. The time varying conversion matrix is then averaged over time to yield a fixed matrix M for use in converting newly-sensed internal cardiac signals into surface EKG signals. (Kroll et al., col. 6, line 61 – col. 7, line 5).

Thus, Kroll et al. utilizes multiple internal cardiac signals to generate emulated surface EKGs. In fact Kroll et al. explicitly teach away from using a single cardiac signal to derive information pertaining to atrial and ventricular signals. For example, Kroll et al. disclose that atrially involved signals generally give a better presentation of the P-wave than other signals as the P-wave originates in the atrium. Kroll et al. further disclose that signals that are primarily associated with the ventricles generally make better sources for emulating the QRS complex, which is primarily derived in the ventricles, than other signals. (Kroll et al., col. 20, lines 60-67).

Kroll et al. do not therefore disclose or suggest adjusting relative portions of a single cardiac signal that correspond to atrial signals and portions of that same signal that correspond to ventricular signals so as to yield an emulated surface EKG as recited in the present application. Accordingly, Applicants respectfully submit that claims 1, 15 and 16 are novel and non-obvious over Kroll et al. and are therefore allowable. Applicants further submit that claims 2-14 that depend from claim 1 are allowable as is claim 1 and for additional limitations recited therein.

The Examiner rejected claims 5 and 9 under 35 U.S.C. §103(a) as being unpatentable over Hedberg et al. or Kroll et al. Applicants respectfully traverse this rejection. In view of the foregoing analysis of independent claim 1 in view of Hedberg et

al. and Kroll et al., Applicants believe that the rejection of dependent claims 5 and 9 under §103 is rendered moot as claims 5 and 9 depend from allowable independent claim 1. Applicants therefore respectfully request that this rejection be withdrawn.

The Examiner provisionally rejected claims 1 and 6-16 on the ground of non-statutory double patenting as being unpatentable over claims 1-12 of co-pending U.S. Patent Application Serial No. 10/735,944. Applicants will file a terminal disclaimer to obviate this rejection in the last to issue application, be that the present application or Application Serial No. 10/735,944.

In light of the above remarks, it is respectfully submitted that the application is in condition for allowance, and an early notice of allowance is requested.

Respectfully submitted,

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Date

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